



Audiovisual Statistical Learning and Autistic Traits

R.M.A. Besney¹, J.K. Toulmin³, A. Youm³, E.S.J. Morden¹, S.E. Schulz^{1,2}, T.K. Sadler⁴, S. Ferber³, R.A. Stevenson^{1,2}

Western University: ¹Dept. Psychology, ²Brain and Mind Institute, ⁴Program in Neuroscience; ⁴University of Toronto, Psychology Dept.



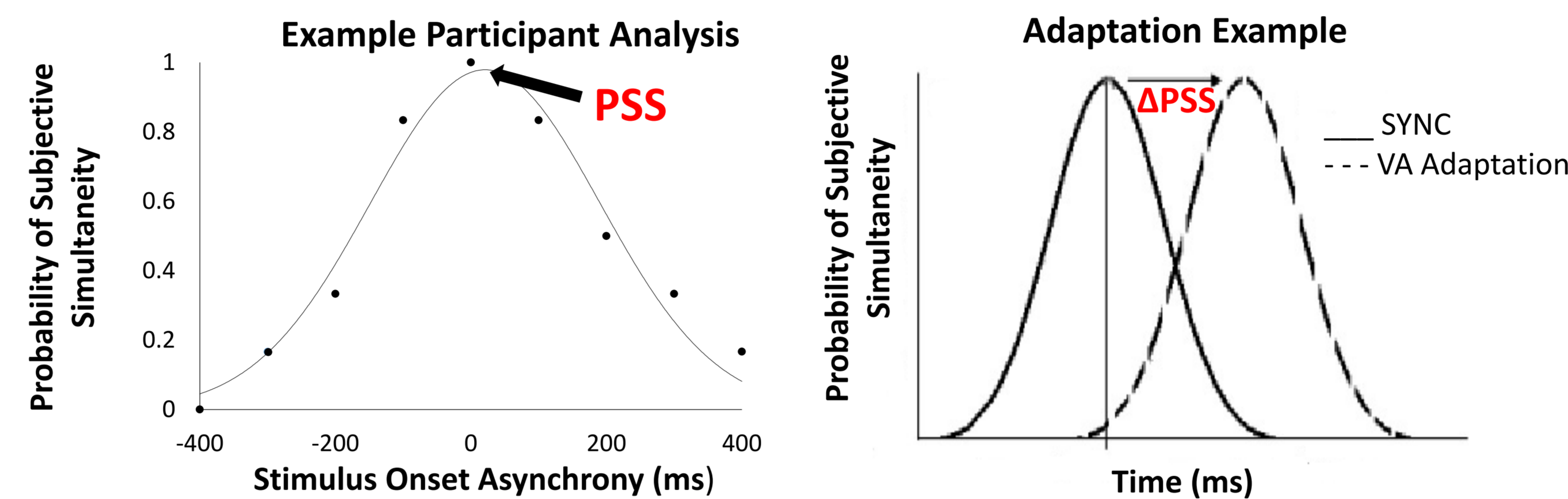
Background

- Throughout development, we hone the ability to integrate multisensory information by learning the statistical regularities of sensory inputs, particularly their relative timing.
- Temporally aligned auditory and visual inputs are more likely to be integrated.
- Autistic individuals exhibit decreased rates of integration across sensory modalities.
- The predictive coding hypothesis suggests this is due to a decreased ability to learn statistical associations between sensory inputs.
- We used a perceptual learning paradigm to explore the relationship between statistical learning related to sensory integration and autistic traits in a non-clinical sample.

Is there an association between statistical learning and the trait of *attention to detail*?

Analyses & Hypotheses

- Rates of perceived simultaneity were calculated for each individual at each temporal offset of the SJ task.
- Gaussian curves were fit to the data, and each participants *Point of Subjective Simultaneity* was extracted for each adaptation condition.



- **Hypothesis 1:** We expect AV and VA adaptations to cause the PSS to shift toward the adapted temporal offset.
- **Hypothesis 2:** We expect the shifts in PSS to be negatively correlated with the autistic trait of *attention to detail*, which is associated with decreased sensory integration.

Results

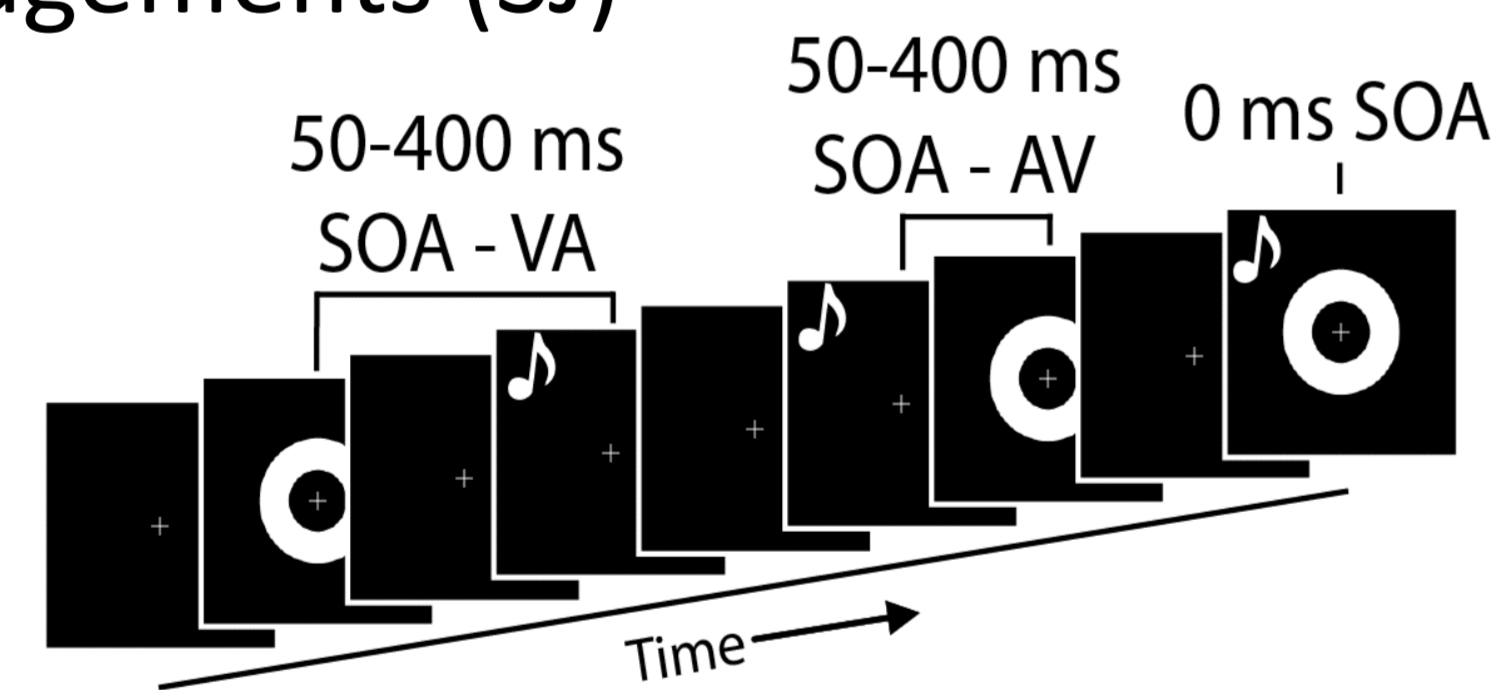
- Visual-leading adaptation successfully induced a shift in in PSS, confirming temporal recalibration as a result of statistical learning.
- We found that visual-leading adaptation effect was significantly correlated with the *attention to detail* subscale of the AQ.
- Post hoc, exploratory analyses were conducted with other AQ subscales, but significant correlations were restricted to our subscale of interest, *attention to detail*.
- No shift was observed with audio-leading adaptation. As such, no correlative analysis was conducted with this condition.

Individual differences in statistical learning were related to the autistic tendency to focus on details, or local features of sensory inputs.

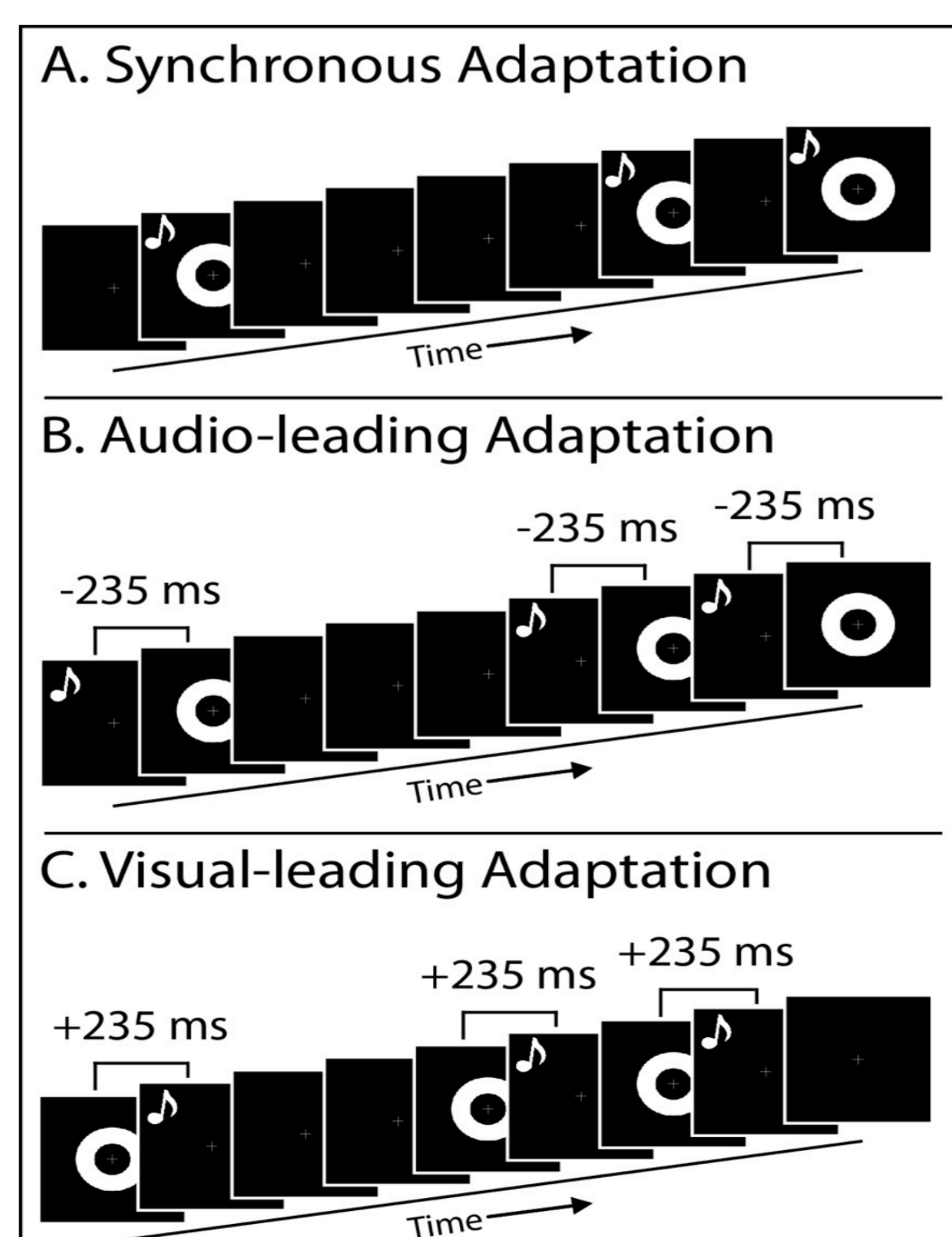
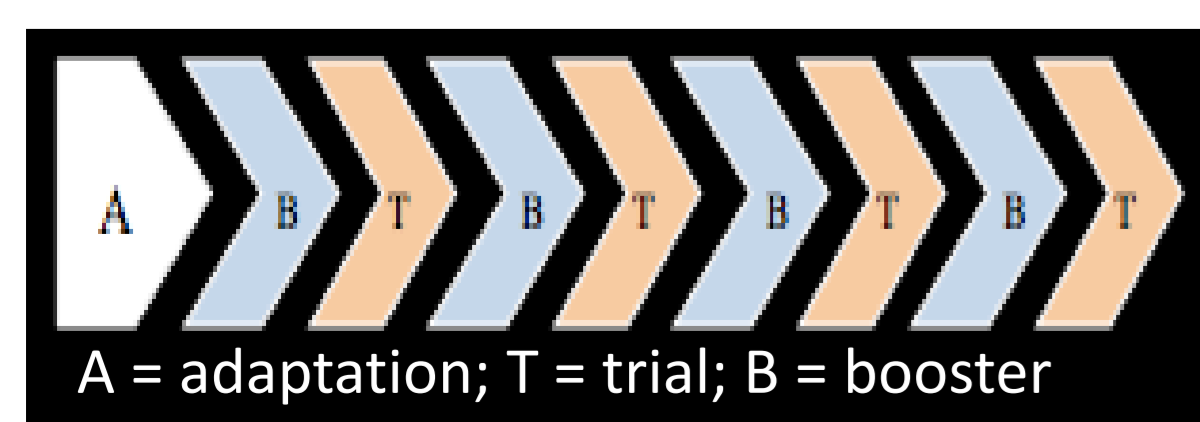
Methods

- Participants: 57 adults (44F, Mean Age = 19)
- Autism Quotient
- Task: Simultaneity judgements (SJ)

Same time or different?

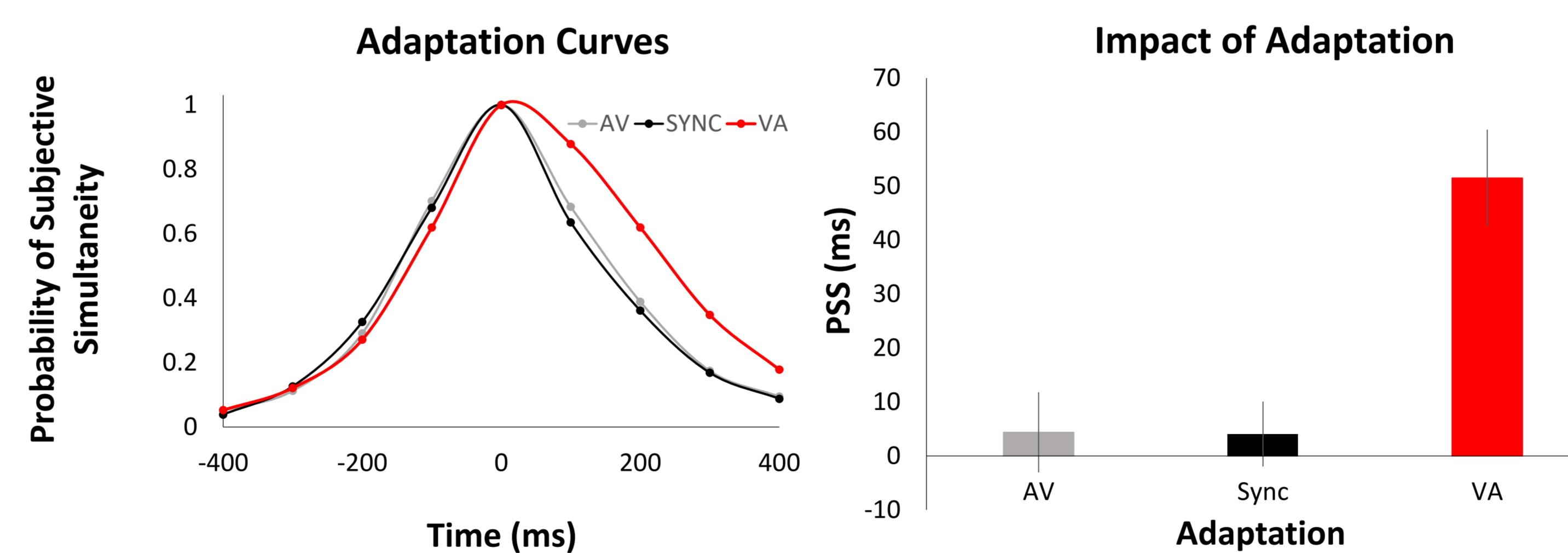


- Adaptation conditions:
 - Synchronous
 - Audio leading
 - Visual leading
- 3 minute adaptation phases were presented at the beginning of a run, with “boosters” interleaved with SJ trials.

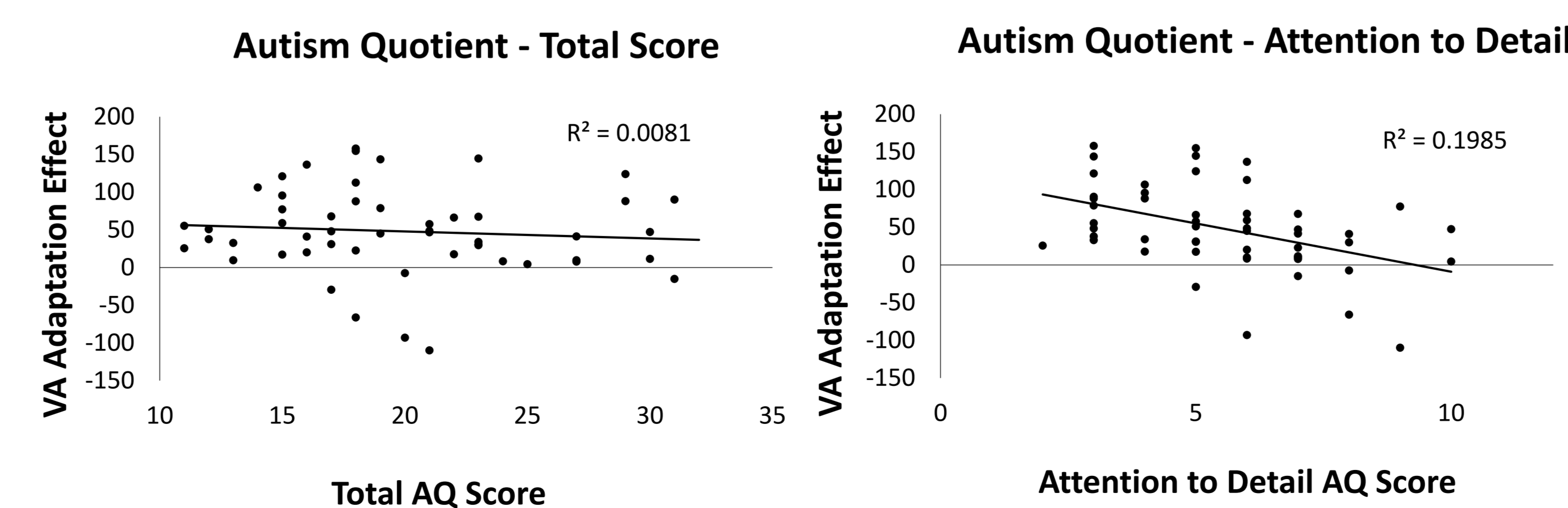


Results

- Paired t-tests were conducted to measure if adaptation shifted the PSS – it did, but only in the VA adaptation.



- VA adaptation was correlated with *attention to detail* subscale and total AQ score.



Discussion

- These results support the predictive coding hypothesis, suggesting that traits associated with autism are linked to decreased abilities to learn the statistical regularities of the environment.
- Sensory information is typically integrated across modalities based on statistical regularities including the temporal relationship between inputs.
- *Attention to Detail* measures the default perceptual tendency to focus on the component features of sensory inputs at the expense of the integrated percept in autism.
- Impairments in multisensory integration may thus stem from a decreased ability to learn the statistical relationships between multiple sensory inputs.

References

Pellicano, E., & Burr, D. (2012). When the world becomes 'too real': A bayesian explanation of autistic perception. *Trends in Cognitive Sciences*, 16(10), 504-510.

Contact: rbesney@uwo.ca